

## REMARKS/ARGUMENTS

Claims 6-11, 33 and 34 are pending. Claims 6-11, 33 and 34 have been rejected. Claims 6, 8, 11, and 33 have been amended. The amendment of Claim 6 is supported by page 3, lines 17-21; page 4, lines 30-33; and page 5, lines 1-7. The amendment of Claim 8, 11 and 33 is supported by page 3, lines 17-21. New Claims 35-37 have been added and are supported by page 4, lines 30-33 and page 5, lines 1-7.

### *Claim Objection:*

The Office Action has objected to Claim 7, as being improper for failing to further limit the subject matter of a previous claim. The Office Action states, “[t]he limitation recited in dependent Claim 7, ‘. . . wherein the property enhancing compound is talc”, can be found in the independent Claim 6. Applicants point out that Claim 6 requires “a property enhancing compound comprising talc.” Thus, it is clear that Claim 7 narrows Claim 6, because the property enhancing compound is not merely comprised of talc, but it “is talc”. Applicants, thus, respectfully request withdrawal of this objection.

### *The §103(a) Rejection (Wallin in view of McArdle):*

Claims 6 and 7 have been rejected under 35 U.S.C. §103(a) as being obvious over Wallin U.S. Publ. No. 2001/0038810 in view of McArdle et al., U.S. Publ. No. 2002/0095871 (“McArdle” herein).

The Office Action recognizes that Wallin fails to “disclose talc as one of the precursor compounds used to obtain the disclosed porous mullite.” The Office Action cites McArdle et al. motivated by the fact that fillers such as talc affect properties of ceramics such as hardness, porosity level, wear behavior, and more [0053].”

McArdle only describes talc among other ceramics used as a filler [0053] in an abrasive aggregate for use in a grinding wheel (abstract). Filler, by McArdle and by definition, is an inert mineral powder that merely is bound together by a ceramic binder [0040 and 0053]. Thus, if one were to incorporate McArdle into Wallin, it would merely result in intact talc particles being incorporated into, for

example, the pores of the porous acicular mullite. In contrast, the method as now claimed in amended Claim 6 is a method to form a crystalline (mullite) compound porous body through by the application of heat and temperature to form a “mullite composition comprised substantially of acicular mullite grains that are essentially chemically bound.”, where it is now clear that the property enhancing compound reacts and is incorporated into the grain boundary interface amorphous phase. Since McArdle incorporated into Wallin would fail to make a mullite that incorporates an element from the talc under heat and fluorine sufficient to make such a reaction formed mullite, amended Claim 6 is non-obvious over McArdle.

**The §103(a) Rejection (Wallin in view Joy):**

Claims 8-11 and 33 and 34 have been rejected under 35 U.S.C. §103(a) as being obvious over Wallin in view of Joy III, U.S. Pat. No. 4,526,886.

The Office Action states:

Wallin et al., also, disclose that the metal elements are chemically bounded to the ceramic grains of the porous catalyst ([0037]). . . . Furthermore, Wallin et al., in an example, disclose the use of platinum oxide in a very small amount of 0.84 gram per liter ([0064]).

Applicants point out, paragraph 37 merely defines one type of catalyst that may be bound to the grains of the acicular mullite such as in para. 31. As to the platinum oxide, the Office Action is correct that a platinum oxide is mentioned in an example, but it is then reduced to platinum metal. The platinum oxide is, also, not on the acicular mullite grains but on ceramic particles of alumina (aluminum oxide wash coat particles). (see paras. 60 and 61). That is, the platinum oxide is not present during the formation, but is merely added after the mullite has been formed and is not ever under a fluorine containing atmosphere.

The Office Action, then states, “[a]lthough Wallin et al. do not expressly disclose any of the other disclosed property enhancing compounds ([0031]-0032)) which are mostly claimed in the instant application, it would have been obvious to a person of ordinary skill in the art to have used a different property enhancing compound and/or mixture of them motivated by the fact that Wallin et al.

disclose a number of different metal catalysts ([0031]-[0032]); therefore, they have the same functionality.” Applicants, fail to understand, how an element because it merely may be used as a catalyst can lead to the conclusion that each of the elements have the same functionality for anything. If this were true, why do automakers continue to use Pt in catalytic converters if each of the listed catalysts have the same functionality as catalysts? The reason, of course, even as catalysts, the elements or differing mixtures of them will have very different catalytic behavior. Therefore, such a conclusion, even for the elements as catalysts, is not supported. Regardless, Wallin is utterly silent as to any of these elements or compounds being useful for anything other than catalysts. That is Wallin fails to describe that any of these are useful in a method to make an improved thermal shock resistant porous acicular mullite as in the present invention.

Further, the Office Action recognizes that “Wallin et al., is silent to the use of both iron and magnesium in the claimed ratio and of magnesium and neodymium in any particular weight ratio. Applicants agree and also point out that Wallin is silent as to any particular combination of elements or compounds as catalyst or anything else other than precursors used to make the mullite and the ratio of the Pt to alumina in the example.

Joy is also recognized by the Office Action not to disclose any ratio of Nd/Mg, Fe/Mg or any combination of metal that are present in amended Claim 11 and 33. Applicants point out that Joy fails to describe any combination or ratio of metals now required in amended Claim 8. The Office Action states, “it [Joy] discloses a range of 0.01 to 25 wt.%, based on the total metal content, of each one of them being present in the catalyst; thus it would have been obvious to one of ordinary skill in the art, at the time of invention, to have utilized a content of Nd and Mg with the claimed range so to obtain a ratio within 0.1 to 20 or 0.2 to 5 wt% motivated by the fact that Joy, III, discloses that such base metals contribute to physical and/or thermal stability of the catalyst; moreover, motivated by the fact that the combination of metals is more effective in catalytic activities (column 2, lines 25-31, 33-36).”

The Office Action then notes, “that while Joy, III. does not expressly disclose a weight ratio or 0.1 to 10 or 0.2 to 5 for Nd/Mg, it discloses a range of 0.01 to 25 wt.%, based on the total metal content, of each one of them being present in the

catalyst; thus, it would have been obvious to one of ordinary skill in the art, at the time of invention, to have utilized a content of Nd and Mg with the claimed range so to obtain a ratio with 0.1 or 0.2 to 5 wt% motivated by the fact that Joy, III. discloses that such base metals contribute to physical and/or thermal stability of the catalyst; moreover, motivated by the fact that the combination of metals is more effective in catalytic activities (col. 2, lines 25-31, 33-36)”.

Applicants disagree and respond as follows. Joy is directed to a Pt, Rh, U catalyst that may have one or more base metal also deposited on a high surface area refractory (i.e., wash coat), which then may be deposited on a ceramic substrate such as mullite (col. 2, lines 25-50; col. 3, lines 63-68; col. 5, lines 45-68). At the particular citation by the Office Action (col. 2, lines 25-31 and 33-36), Joy does not state that these base metals are more effective in combination, but that a base metal, as a metal, may be used to stabilize Pt and Rh catalysts and that these base metals have no catalytic effect or significantly less catalytic effect (col. 2, lines 20-50). The base metal may be any base metal other than a Pt group metal and is typically Ni. (col. 2, lines 24, 25 and 40-50). Thus, the incorporation of Joy into Wallin, at best would suggest to one of ordinary skill in the art to use a washcoat catalyst with a Pt-Rh catalyst that may be stabilized by any one or more of a large number of metals in the periodic table with the only one specifically specified “Ni”. Certainly, there is no suggestion, by either Wallin or Joy to use any particular “metal” in a method to form an improved thermal shock resistant mullite. For this reason, Claims 8, 11 and 33 and their dependent Claims are non-obvious over Wallin in view of Joy.

Next, the Office Action’s contention that combinations are “more effective in catalytic activities” is refuted by Joy (i.e., no catalytic effect of base metals or significantly less than the Pt group metal) and as such is in direct contradiction to the Office Action’s previous contention that the catalysts of Wallin have the same functionality, because they do not even have the same catalytic effect as per Joy and as described above. That is the premise that the catalysts have the same functionality, is not supported even by the Office Action’s own citation to Joy, which clearly teaches that even the catalytic effect of the base metals are different or have none compared to Pt group metals. In addition, this contention is in contradiction to alkali or alkaline earth metals having detrimental effects in combinations with Pt group metals (see, for

example, U.S. Pat No. 4,480,050, col. 3, lines 1-11 in referring to Pt catalysts). For this reason, Claims 8, 11, and 33 and their dependent Claims are non-obvious over Wallin in view of Joy.

Further, the Office Action has failed to point out, where in Joy, any combination of metals other than Pt, Rh, U and Ni is disclosed for anything. Joy merely suggests that a base metal amongst a myriad may be used with the Pt, Rh, U catalyst of Joy (col. 2, lines 40-50) including ones that are known to be detrimental to Pt catalytic effect. Claims 8, 11, and 33 each require particular combinations of metals in a process to form mullite to realize an improved shock resistant porous mullite. No rationale has been provided for these particular combinations by the Office Action. That is, neither Wallin nor Joy even suggest such a combination for catalyst, whereas these particular combinations have been discovered by the Applicants when used in a method to form mullite results in a mullite with improved thermal shock resistance. Since, neither Wallin nor Joy independently or together describe in any way the claimed combinations in a method to form mullite and no rationale has been presented as to why these combinations should be selected for anything, no *prima facie* case has been made and as such Claims 8, 11 and 33 and their dependent Claims are non-obvious over Wallin in view of Joy.

Penultimately, with regard to Nd/Mg, the Office Action notes, that Joy, III. “does not expressly disclose a weight ratio of 0.1 to 10 or 0.2 to 5 for Nd/Mg, it discloses a range of 0.01 to 25 wt.%, based on the total metal content, of each one of them present in the catalyst . . .” Ignoring the fact, that neither Wallin nor Joy independently or together describe in any way such a combination of Nd/Mg or that Joy only is directed to a Pt, Rh and U catalyst on a wash coat, the rationale that one would select a weight ratio somewhere in this range for thermal stability motivated by that fact that these metals may contribute to the stability of Pt, Rh, U catalyst of Joy or the refuted contention that combination of metals is more effective in catalytic activities is unsupported. That is the reason one would select a particular ratio in this weight range has not been presented. For example, why not 20/1, 30/1, 40/1, 50/1, 60/1 etc. or vice versa. In other words, Applicants ask, where in Wallin or Joy, is there, to reiterate, any teaching of particular combinations of elements or any weight ratios of these elements? In the absence of any description of any ratio, there can be

no suggestion of a ratio and as such Claims 11 and 33 are nonobvious over Wallin in view of Joy for this additional reason.

Finally, Claims 8, 11 and 33 are non-obvious because the applicants have discovered that a more thermal shock resistant mullite is formed when the composition is made with particular combination of elements and in the case of Claims 11 and 33 particular ratios of particular combinations of elements. That is the applicants have discovered a result effective variables, particular combinations and ratios of particular combinations used in a method to make a more thermal shock resistant mullite composition. Neither of the references mention such a property and neither describe that combination nor any ratio of any elements are useful to make such a thermal shock resistant mullite composition. Thus, just as in *In re Antonie*, it is well established that the discovery of a result effective variable for a particular purpose is non-obvious. *In re Antonie*, 559 F.2d 618, 620 (1977 CCPA). Applicants have discovered such a result effective variable (i.e., particular combinations of elements when making the mullite and ratios of particular combinations), and not only that, Applicants have also discovered the effect (improved thermal shock resistance), which was not known. For this reason, Claims 8, 11 and 33 are non-obvious over Wallin in view of Joy.

Considering the foregoing reasons and amendments, Claims 6-11 and 33-37 are patentable. Applicants, therefore, respectfully request withdrawal of all rejections and allowance of Claims 6-11 and 33-37.

Respectfully submitted,

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